

ON THE REVISION OF THE MOLLUSK GENUS *PTERINEA* GOLDFUSS.

BY HENRY SHALER WILLIAMS,
Of Cornell University, Ithaca, New York.

In the course of preparing descriptions of the fossils of the Chapman sandstone of Maine (from specimens belonging to the U. S. National Museum in Washington), it has been found necessary to revise the generic limits of the genus *Pterinea* as originally defined by Goldfuss.^a

In the generic diagnosis (both the Latin and German forms of it) Goldfuss made no mention of the surface sculpture. In the present state of taxonomy, however, the presence or absence of radial surface sculpture appears to be of more than specific significance.

It is therefore proposed to restrict the genus *Pterinea* to that section of the original genus which includes the first species, *Pterinea laevis*, as type, the surface of which is normally marked only by concentric lines of growth; and to erect new generic groups for the other species of Goldfuss's genus.

The following fourteen species were placed under the generic name *Pterinea* by Goldfuss:

1. *Pterinea laevis*, the type of *Pterinea* Goldfuss, *sensu stricto*.
2. *P. ventricosa*, the type of *Micropteria* Frech.
3. *P. bicarinata*, *Grammysia bicarinata* Goldfuss species.
4. *P. plana*, a species of *Tolmaia*, new genus.
5. *P. elongata*, a species of *Tolmaia*, new genus.
6. *P. lineata*, the type of *Tolmaia*, new genus.
7. *P. radiata*=? an Aviculopectinoid shell.
8. *P. carinata*, *Byssopteria carinata*.
9. *P. elegans*, a species of *Cypricardinia*.
10. *P. lamellosa*, a species of *Actinopterella*, new genus.

^a Goldfuss, *Petrefacta Germaniae*, 2d ed., 1863, Pt. 2, pp. 126-129, pls. cxxix-cxx.

11. *P. reticulata*, a species of *Actinopterella*, new genus.
12. *P. trigona*, *Conocardium trigona*.
13. *P. costata*, a species of *Cornellites*, new genus.
14. *P. fasciculata*, the type of *Cornellites*, new genus.

Of the above list, numbers 2, 3, 7, 8, 9 and 12 are already recognized by authors as not included in Goldfuss's genus *Pterinea*. The disposition of them and the other species is indicated above at the right of the list of names.

Of the original species described by Goldfuss under the generic name *Pterinea* the following are without radial surface sculpture: *Pterinea laevis*, *P. ventricosa*, *P. bicarinata*, *P. plana* (in part as represented by figs. 4 *b, c, d, e* and *f*, not 4 *a*).

Pterinea laevis is the first species described and well illustrates the genus. It is the type of the section of *Pterinea* in which there is no radial sculpture,^a and may appropriately be taken as the type of the genus as emended.

Genus PTERINEA Goldfuss (sensu stricto).

Type.—*Pterinea laevis* Goldfuss.

Diagnosis.—1. Hinge line long.

2. Valves equal in circumference but unequal in convexity; both more or less convex; the left valve always convex; the right valve in first half of growth convex but less so than the left, and low convex to flat or concave (resupinate) in the ventral part of shell at maturity.

3. Ears well developed, more or less distinctly differentiated from the body of shell, reaching to or in front of the extreme anterior edge of the body of the shell.

4. Wings more or less distinctly differentiated from the body, flattened, reaching posteriorly as far as the extreme posterior margin of the shell.

5. Body of shell with its longer axis produced ventrally at a considerable angle from the hinge line.

6. Posterior muscular scar distinct, large and more or less sharply impressed in the shell wall.

7. Anterior muscular scars small and generally strongly impressed, situated on the ear, not body, of the shell.

8. Ligamental area well defined and longitudinally striate.

9. Posterior lateral teeth (or tooth) distinct, elongate, and situated at or near the junction of wing with the body of the shell.

10. Anterior cardinal teeth distinct, short, separated from the lateral teeth, and inclined at large angle from hinge line.

^a Frech's "gruppe der *Pterinea laevis*," Die devonischen Aviculiden Deutschland; Königl. Preussch. Geol. Landesanstalt, Abhandl., IX, Pt. 3, 1891, p. 79-80.

11. Surface smooth with concentric growth lines of surface entire, normally not wrinkled or elevated into radial lines or ribs.^a

The type of the genus, *Pterinea laevis* Goldfuss, comes from the upper Coblenzian, Ems, Germany. The Ordovician species *Pterinea demissa* of Conrad, and *Avicula ampliata* Phillips of English Ordovician may belong to the genus thus emended.

(? Subgenus) **MICROPTERIA** Frech.

Type.—*Pterinea ventricosa* Goldfuss.

Pterinea ventricosa is shown by Frech^b to be separated from the group of *P. laevis* by the continuity of its hinge teeth and by the smallness of the anterior ear. The form of convexity of the left valve of that species is different from typical *Pterinea laevis*. *P. ventricosa* forms the type of Frech's division "gruppe der *Pterinea ventricosa*," regarding the character of the teeth of which he says, "und könnte wegen dieses, an Actinodesma erinnernden Merkmals zum Vertreter einer Untergattung (etwa Micropteria) erhoben werden."^c This removes *P. ventricosa* from the genus *Pterinea* Goldfuss, *sensu stricto* as here emended. *Pterinea bicarinata* is a Grammysia. *Pterinea plana* Goldfuss is recognized by German authors as in part equivalent to *P. lineata*. The smooth valves will probably remain in the genus *Pterinea*.

PTERINEA LINEATA GOLDFUSS THE TYPE OF A NEW GENUS
TOLMALA.

Besides the typical group of *Pterineas* the original genus of Goldfuss includes several species with distinct radial surface sculpture. The *Pterineas* with fine radial lines were made by Frech the type of his "gruppe der *Pterinea lineata*" for which he gave the following diagnosis: "Linke trappe gewölbt, rechte flach. Radial streifen fein. Vorderes ohr undeutlich."^d This group forms a definite and natural section of the original Goldfuss genus *Pterinea*. In the diagnosis of the genus, therefore, belong in addition to the points of difference the other positive characters of the original genus, namely, the long hinge line, but chiefly posterior to umbones; right valve resupinate;

^a Frech's remark that "*Pterinea laevis* . . . zeigt zuweilen Andeutungen von Radial rippen" (pl. x, fig. 3 b), (Die Devonischen Aviculiden Deutschland, p. 80), does not invalidate the restriction above made, but furnishes reason for the opinion that generic characters like specific characters can not be regarded as absolutely fixed. In the specimen referred to by Frech there is a rudimentary puckering of the border of the outer shell lamella in a late stage of growth. It is, however, sufficient to state that this is abnormal to the group of shells to which the emended definition of the genus *Pterinea* Goldfuss applies.

^b Die Devonischen Aviculiden Deutschland, p. 97.

^c Idem, p. 80.

^d Idem, p. 79.

presence of cardinal and lateral teeth; general form of the shell; and well defined muscular scars. In *P. lineata* the radial sculpture covers the body, wing, and ears of the left valve; in the right valve the radial markings are restricted to the posterior wing.

Erecting this group into generic rank it is proposed to call it Tolmaia.^a Frech included as representative species in the group the species *Pterinea lineata* Goldfuss (with *Pterinea elongata* Goldfuss, *P. plana*, ex parte, f. 4, *P. lineata* Goldfuss of Sandberger, Roemer and Follmann, and *Pseudomonotis minuta* Maurer, as synonyms of *P. lineata*) and the species *Avicula expansa* Maurer as emended by Frech.^b

In describing the "gruppe" as a genus and applying to it a definite generic name it is intended to adopt as much as possible of Frech's definition.

TOLMAIA, new genus.

Type.—*P. lineata* Goldfuss.

Diagnosis.—A Pterinoid shell of medium size, the anterior ear inconspicuous ("vorderes ohr undeutlich"); fine radial sculpture marking the surface of the shells ("radial streifen fein"); combined with the following characters which the genus holds in common with *Pterinea* Goldfuss as here emended: namely, valves inequivalve; left valve convex but less so than in group of *Pterinea costata*; right valve less convex than left and flat to concave (that is, resupinate) toward its ventral end; both anterior ear and posterior wing present; ligamental area longitudinally striate; cardinal teeth short and radial; lateral teeth (or tooth) oblique, situated near junction of wing and body; anterior muscular scar well defined, small and situated on the anterior ear. The type species is from the Upper Coblenzian, Coblenz, Germany. The species *Pterinea* (*Pterinotella*?) *incurrata* Clarke may belong to this genus.

A NEW GENUS FOLLMANNELLA PROPOSED FOR PTERINEAS OF THE GENERAL FORM OF *P. OSTREIFORMIS* FRECH.

In the "gruppe der *Pterinava ventricosa*" Frech included a new species described by him under the name *Pterinea ostreiformis*.

This species differs from *P. ventricosa* in having fine radial lines on the left valve and in other ways. Specimens from Maine offer superficial resemblance to Frech's species, but differ from both the genus *Micropteria* Frech and the species *Pterinava ostreiformis* Frech. A Maine specimen has already been figured, and specifically named by Clarke *Pterinea mainensis*,^c which will serve as a type for this new

^a From the Greek *τολμα*, signifying boldness or courage.

^b Frech, Die devonischen Aviculiden Deutschland, pp. 90, 91.

^c Some new Devonian Fossils, N. Y. State Mus. Bull., No. 107, 1907, p. 201.

genus. For this group the name *Follmannella* is proposed in honor of Dr. Otto Follmann, who has rendered a lasting service to Paleontology in his work *Über Devonischen Aviculaceen*.

FOLLMANNELLA, new genus.

Type.—*Pterinea mainensis* Clarke.

Diagnosis.—Pterinoid shells with low convex left valve, and flat or concave (resupinate) right valve; hinge line produced, wider than body of shell in young, but much shorter than greatest width of mature shells. Body of shell oblique, in young shells inclining backward 25 to 40 degrees from the hinge line in a straight line; in mature shells (50 mm. long and over) the lower part of the body curves backward forming a broad posterior extension, the extreme margin of which reaches considerably beyond the posterior end of the wing. This is a characteristic expression of full grown shells of this genus.

Radial sculpture on outer surface of nondecorticated left valves usually fine and numerous as in *Tolmaia*; similar sculpture on body of right valves of type species but less distinct than on left valves. Cardinal teeth, posterior lateral teeth, muscular scars, and resupination of right valve as in *Pterinea* (*sensu stricto*), *Tolmaia*, and *Cornellites*. Teeth not as in *Micropteria*.

The type species of this genus is from the Eodevonian of Moosehead Lake region in Somerset County, Maine.

A NEW PTERINOID GENUS ACTINOPTERELLA RESEMBLING EXTERNALLY THE AVICULOID GENUS ACTINOPTERIA.

Among the Pterinoid shells of Maine, specimens which at first were referred to *Actinoptera* appear to be distinctly Pterinoid, as shown by their teeth and muscular scars, but differ generically from the *Pterineus* (see *Tolmaia*) by their strongly convex right valves.

For this group of shells the generic name *Actinopterella* is proposed.

ACTINOPTERELLA, new genus.

Type.—*Pterinea radialis* Clarke, part.

Diagnosis.—Oblique pterinoid shells with posterior wing and anterior ear both well developed; both valves strongly convex, left valve ventricose, with narrow oblique body; right valve generally less convex than left but convex from beak to ventral margin, not becoming resupinate. Umbones protruding slightly beyond the hinge line. Ligamental area well developed, striated; cardinal teeth present, three or four in number; lateral teeth (or tooth) well developed and close to ligamental area. A small, deep, anterior muscular scar

situated on the ear; the large posterior muscular scar is obscure. Surface ornamentation fine or strong radial ribs on body and wing and occasionally on ear of left valve; radial ribs on body of right valve occasionally strong but generally obscure. Size smaller than many pterinoids, largest specimens from Maine collections rarely over 35 mm. long.

Several species of this type have been recognized in the Chapman fauna of Maine, the description of which was in process when Clarke's paper on Some new Devonian Fossils was issued. The species referred to were found to differ from *Actinoptera* Hall in their interior characters, and they differ also from the radially sculptured *Pterineas* of Goldfuss in having the right valve convex from the beak out to the ventral margin, though less convex than the left valve (not resupinate as in my new genus *Tolmaia*.)

In the description of *Pterinea radialis* Clarke refers to teeth and anterior muscular scar in combination with an Actinopteria-like exterior, but in figuring the species he has given first two figures of the exterior of Actinopterella followed by two figures of *Follmannella*, new genus.

In citing the name *Pterinea radialis* Clarke as type of the genus the latter two figures are not included and the statement that the "hinge line is but slightly extended" does not apply to specimens of the genus *Actinopterella* although it does apply to *Follmannella* represented by the lower two figures.

Pterinea edmundi Clarke^a also belongs to the genus *Actinopterella*.

The description and figures of *Pterinotella peninsula* Clarke^b also indicate molds of the interior of right valves of this same species. Because of the uncertainty and confusion occasioned by the wording and figures given under the name *Pterinea radialis* Clarke, the following brief definition of *Actinopterella radialis*, based upon specimens collected for the U. S. Geological Survey, is here given. The illustration and full discussion of the species is reserved for the monograph of the Chapman Fauna now in preparation.

ACTINOPTERELLA RADIALIS Clarke, sensu stricto.

1907. *Pterinotella radialis* CLARKE, part, N. Y. State Mus. Bull. No. 107, p. 207, upper figures only (the lower figures represent the characters of *Follmannella*, new genus). EoDevonian, Presque Isle Stream, Chapman Plantation, Aroostook County, Maine.

1907. *Pterinotella peninsula* CLARKE, N. Y. State Mus. Bull. No. 107, p. 212, figs. on p. 213. EoDevonian, Presque Isle Stream, Chapman Plantation, Maine.

Specific diagnosis.—Shells obliquely rhomboid; hinge line long, equaling greatest width of shell; anterior ear and posterior wing

^a Some new Devonian Fossils, p. 203.

^b Idem., p. 212.

both well developed; anterior ear strong, distinctly separate from shell body; beaks protrude above the hinge line, that of left valve gibbous and larger than that of right valve; posterior margin of body protruding backward about the same distance as the posterior end of wing. Left valve ventricose, right valve convex but less so than the left. Ligament narrow and striate, developed both sides the umbone. Anterior muscular scar small but deeply incised, situated in front of the umbones at the base of foremost cardinal tooth between the ear proper and byssal sinus. Posterior muscular scar large and shallow, situated partly on body of shell, partly on the wing. Teeth several, varying in number (3 to 4); simple cardinal teeth; one or two lateral teeth situated near the edge of the hinge area and nearly, but not quite, parallel to it. Surface of left valve covered with rounded radial riblets, somewhat irregular, varying in size from fine lines to strong riblets, strongest on posterior half of body, either absent or only faintly marked on the wing or ear. Right valve either without radial sculpture, or radial lines or riblets obscure.

The specimens of this species are abundant in the Chapman sandstone on Presque Isle Stream, Chapman Plantation, Aroostook County, Maine, from which the type specimens here illustrated came.

CORNELLITES, new genus.

Type.—*Pterinea fasciculata* Goldfuss.

Generic diagnosis.—A strongly marked Pterinoid shell with gibbous, rather narrow oblique body (left valve); large ear, set off from body by well defined sulcus; a large, broad flat wing, abruptly set off from body; the right valve slightly convex in umbonal region, flat to resupinate ventrally. Ligamental area striate; both cardinal and lateral teeth present; posterior muscular scar distinct and anterior muscular scar smaller and strongly impressed.

The surface marked by a few strong radial ribs, with generally finer radial lines between them, and the fine concentric lamellæ of growth generally evident over the radial sculpture. The radial sculpture covers the body and both wing and ear of the left valve in the type species. In other species which may be referred to the genus the sculpture on the ear is restricted to concentric lines of growth, and the radial markings on the wings may be obscure. The right valve generally lacks radial sculpture except on the posterior wings where it is obscure; occasionally the stronger radial ribs are evident upon the body of the right valve.

The name *Cornellites* is given in honor of Ezra Cornell, the founder of Cornell University, at which institution this description is written. The well marked section of the original genus *Pterinea* is represented by the species *Pterinea fasciculata* Goldfuss and *P. costata* Goldfuss.

It is also represented in America by the common Hamilton form *Pterinea flabella* Conrad.

It was recognized by Frech under the heading "gruppe der *Pterinea costata*." That species while holding the generic characters is more extreme and less typical of the generic characters than *P. fasciculata*, which is here taken as the generic type.

The genus as defined is not certainly known to appear in the Maine rocks. Clarke has described a small species from Presque Isle Stream, under the name *Pterinea cf. fasciculata* Goldfuss, and others from Dalhousie, New Brunswick, under the name *Pterinea fasciculata* Goldfuss, var. *occidentale*, but both of those forms have the right valve convex, whereas in the right valve of *Cornellites* (as in *Pterinea sensu stricto*, *Micropteria*, *Follmannella*, and *Tolmaia*) the right valve, while slightly convex at the umbonal end, rapidly flattens and before reaching the ventral margin in adult shells becomes resupinate.

In North America *Cornellites (Pterinea) flabella* Conrad is a representative species of this genus and it is often abundant in the Hamilton rocks of New York State.

In this paper no attempt is made to go beyond the set of forms included by Goldfuss in his genus *Pterinea*. Of the accepted *Pterineas*, those of the type *P. larvis*, normally without radial surface sculpture, constitute the genus *Pterinea* Goldfuss *sensu stricto*.

The species of type of *P. ventricosa*, without radial surface sculpture, are mentioned under the name *Micropteria* Frech. The species with fine radial sculpture of types of *P. lineata* Goldfuss are called *Tolmaia*; forms resembling *Tolmaia* in sculpture, but having biconvex shells, probably including *P. lamellosa* and *P. reticulata* are assigned to a new genus *Actinopterella*. Other forms of similar surface markings but with large shells and curved body, the ventral portion extending backward beyond the extreme end of wing, like Frech's *P. ostreiformis* in form, are called *Follmannella*, new genus; and finally the species of type *P. fasciculata* and represented in America by *Pterinea flabella* are called *Cornellites*, new genus.

In the preparation of this paper the valuable assistance of Mr. C. L. Breger is hereby acknowledged. He has thoroughly reviewed the literature bearing upon the subject and worked over the materials with the author, making several important suggestions. The author, however, is responsible for the classification and descriptions here given.